Decay on several sorts of heterogeneous centers: Special monodisperse approximation in the situation of strong unsymmetry. 3. Numerical results for the special monodisperse approximation

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This manuscript directly continues [1], [2]. All definitions and formulas have to be taken from [1]. The numerical results for comparison with the total monodisperse approximation have to be taken from [2].

1 Calculations

Now we shall turn to estimate errors of the floating monodisperse approximation. The errors of substitutions of the subintegral functions by the rectangular form are known. They are rather small (≥ 0.1). But the error of the floating monodisperse approximation itself has to be estimated numerically.

Here again we can see that the error of the number of droplets formed on the first type of heterogeneous centers can be estimated in frame of the standard iteration method and it is small. So, only the error in the number of the droplets formed on the second type of heterogeneous centers will be the subject of our interest.

Here again the worst situation occurs when there is no essential exhaustion of heterogeneous centers of the second type.

We have to recall the system of the condensation equations. Here it can be written in the following form

$$G = \int_0^z \exp(-G(x))\theta_1(x)(z-x)^3 dx$$

$$\theta_1 = exp(-b\int_0^z \exp(-G(x))dx)$$

with a positive parameter b and have to estimate the error in

$$N = \int_0^\infty \exp(-lG(x))dx$$

with some parameter l.

We shall solve this problem numerically and compare our result with the already formulated models. In the model of the total monodisperse approximation we get

$$N_A = \int_0^\infty \exp(-lG_A(x))dx$$

where G_A is

$$G_A = \frac{1}{b}(1-\exp(-bD))x^3$$

and the constant D is given by

$$D = \int_0^\infty \exp(-x^4/4)dx = 1.28$$

Numerical results are shown in [2].

In the model of the floating monodisperse approximation we have to calculate the integral

$$N_B = \int_0^\infty \exp(-lG_B(x))dx$$

where G_B is

$$G_B = \frac{1}{b}(1-\exp(-b\int_0^{z/4} \exp(-x^4/4)dx))z^3$$

$$G_B \approx \frac{1}{b}(1-\exp(-b(\Theta(D-z/4)z/4 + \Theta(z/4-D)D)))z^3$$

We have tried all mentioned approximations for b from 0.2 up to 5.2 with the step 0.2 and for l from 0.2 up to 5.2 with a step 0.2. We calculate the

relative error in N. The results are drawn in fig.1 for N_B where the relative errors are marked by r_2.

The maximum of errors in N_B lies near $l = 0$. So, we have to analyse the situation with small values of l. It was done in fig.2 for N_B. We see that we can not find the maximum error. It lies near $b = 0$. Then we have to calculate the situation with $b = 0$. The value of l can not be put directly to $l = 0$. Then we have to solve the following equation

$$G = \int_0^\infty \exp(-G(x))(z-x)^3 dx$$

and to compare

$$N = \int_0^\infty \exp(-lG) dx$$

with

$$N_A = \int_0^\infty \exp(-lDz^3) dz$$

$$N_B = \int_0^\infty \exp(-l(\Theta(z/4 - D)Dz^3 + \Theta(D - z/4)z^4/4)) dz$$

Results of this calculation will be presented together with consideration of the "essential asymptotes" in the next section.

References

[1] V. Kurasov, Preprint cond-mat@xxx.lanl.gov get 0001104

[2] V. Kurasov, Preprint cond-mat@xxx.lanl.gov get 0001108

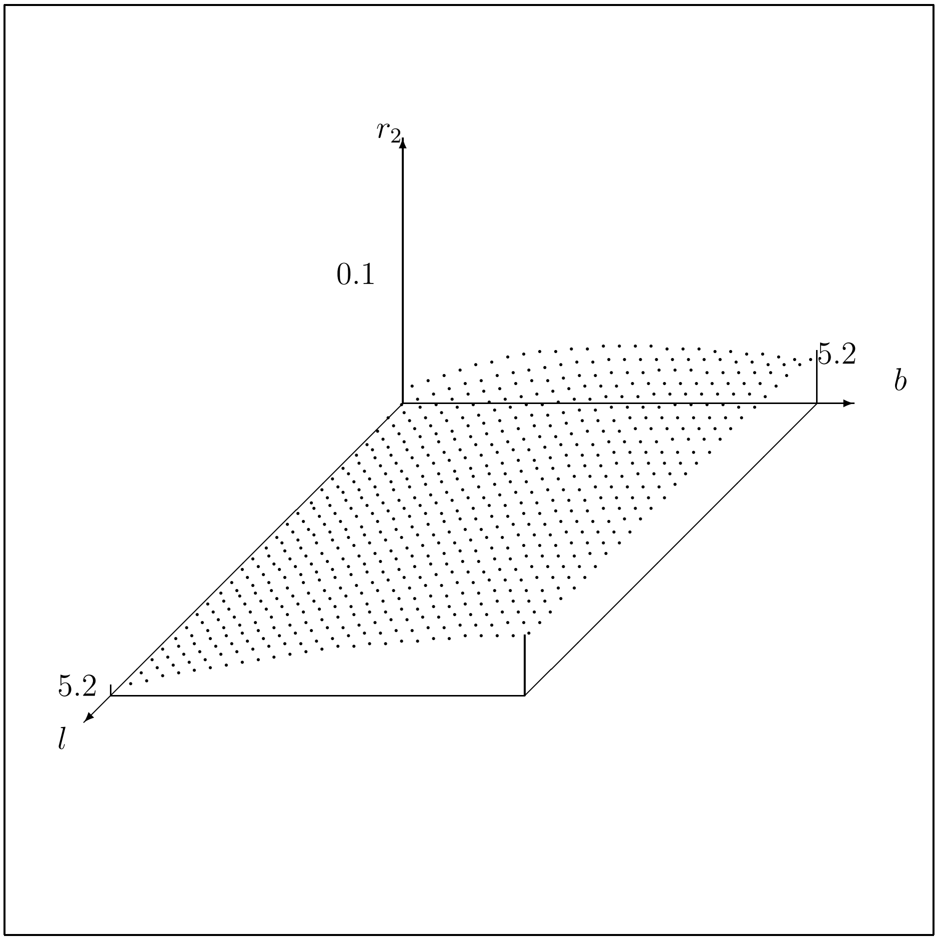

Fig.1

The relative error of N_B *drawn as the function of* l *and* b*. Parameter* l *goes from* 0.2 *up to* 5.2 *with a step* 0.2*. Parameter* b *goes from* 0.2 *up to* 5.2 *with a step* 0.2*.*

One can see the maximum at small l *and moderate* b*.*

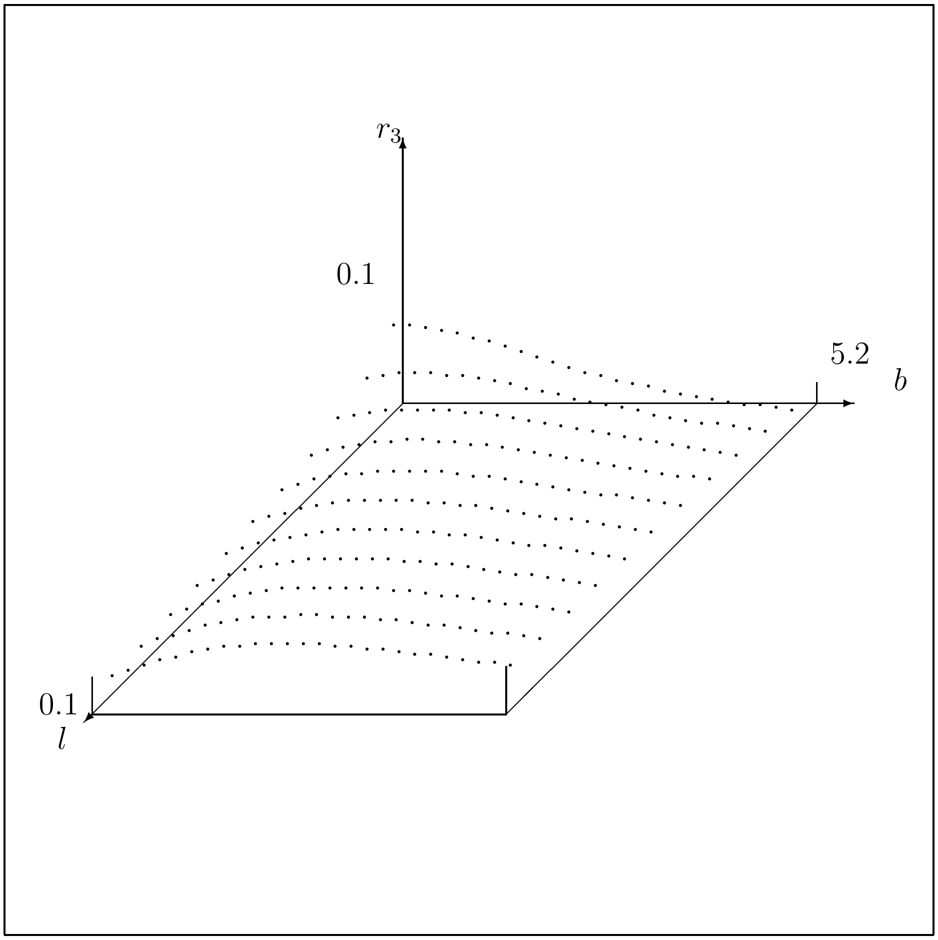

Fig.2

The relative error of N_B *drawn as the function of* l *and* b*. Parameter* l *goes from* 0.01 *up to* 0.11 *with a step* 0.01*. Parameter* b *goes from* 0.2 *up to* 5.2 *with a step* 0.2*.*

One can see the maximum at small l *and small* b*. One can note that now the values of* b *corresponding to maximum of the relative errors become small.*